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Encrypted monument: The birth of crypto place on the blockchain

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ABSTRACT

In this paper, we coin the term “crypto place” to describe an emerging type of virtual place on the blockchain. Using an encrypted monument that was built to memorialize Dr. Wenliang Li, one of the whistleblowers of China’s coronavirus outbreak, we extensively investigate three definitive dimensions of crypto place in terms of decentralized location, immutable locales and transaction-based sense of place. We then reflect upon the complicated social implications of blockchain technology much beyond purely serving as an alternative cryptocurrency, and further examine how place information is stored, disseminated, and incentivized on blockchain. Through this paper, we investigate the relevance of blockchain to geography studies and discuss how it may enrich the concept of place in today’s data-intensive and decentralized world.

“Li, you deserve a monument
In the eternal cemetery
It won't be broken by lightning
Won't be worn down by the years
Nameless people can hold you to remembrance
On the day of February 7, 2020
Your whistle will sound
In every corner, in every sea”
– From an anonymous poet in China

1. Monument on the blockchain

Dr. Wenliang Li, one of the whistleblowers of China’s coronavirus (COVID-19) outbreak, died of the infection on February 7th, 2020 (Huang et al., 2020). Right after his death, an anonymous mourner created a smart contract on the Ethereum blockchain with openly-accessible but encrypted source codes to memorialize this international hero. After we decrypted the source code to utf-8 text (see Fig. 1), an image of a gravestone, including a highlighted “R.I.P.” and an engraved inscription, emerges. This encrypted monument became a popular virtual place for Ethereum users to mourn for the loss of Dr. Li. A monument, no matter physical or virtual, is a place around which people gather for memorial activities. Unlike a physical gravestone or a shrine, building an encrypted monument did not require the complicated and lengthy land-use approval process. Although a web-based virtual monument may also allow people to memorize Dr. Li, the founder decided to encrypt it on the Ethereum blockchain possibly due to the

perceived censorship, as the early online discussion about Dr. Li were widely censored in China (Zhao, 2020).

Blockchain was invented to build cryptocurrencies like Bitcoin, Litecoin or Ethereum that enable their users to trade digital assets without supervision from a central bank or other sovereign administrators (Crosby et al., 2016). With the help of the smart contract function, Ethereum blockchain has transcended Bitcoin by building a market exchange mechanism. Thus, cryptocurrencies can pay for food delivery, ridesharing, and other commodity or service. For example, the blockchain-based market mechanism allowed the Cryptocarbon initiative to transact carbon trading directly in cryptocurrency rather than the U.S. dollar (Howson et al., 2019). Moreover, the rapid proliferation of blockchain technologies has not only transformed the financial sectors but also deeply influenced how information is stored, disseminated and incentivized (Shafagh et al., 2017). We were surprised and gratified to discover an encrypted virtual monument, which can be openly accessed but would not be damaged by natural disasters or removed by any suspected authoritarian censorship. Indeed, blockchain technologies own a strong theoretical root in anarchism as a technologist-utopian move to resist or even rebel against sovereign powers of not only authoritarian states, but modern nation states in general and by extension, state-based multi-governmental bodies such as IMF - International Monetary Fund and state-based global administrative mechanisms such as SWIFT - Society for Worldwide Interstate Financial Telecommunications.

Place is a quintessential concept in human geography. Over the years multiple types of place have been studied such as physical place,

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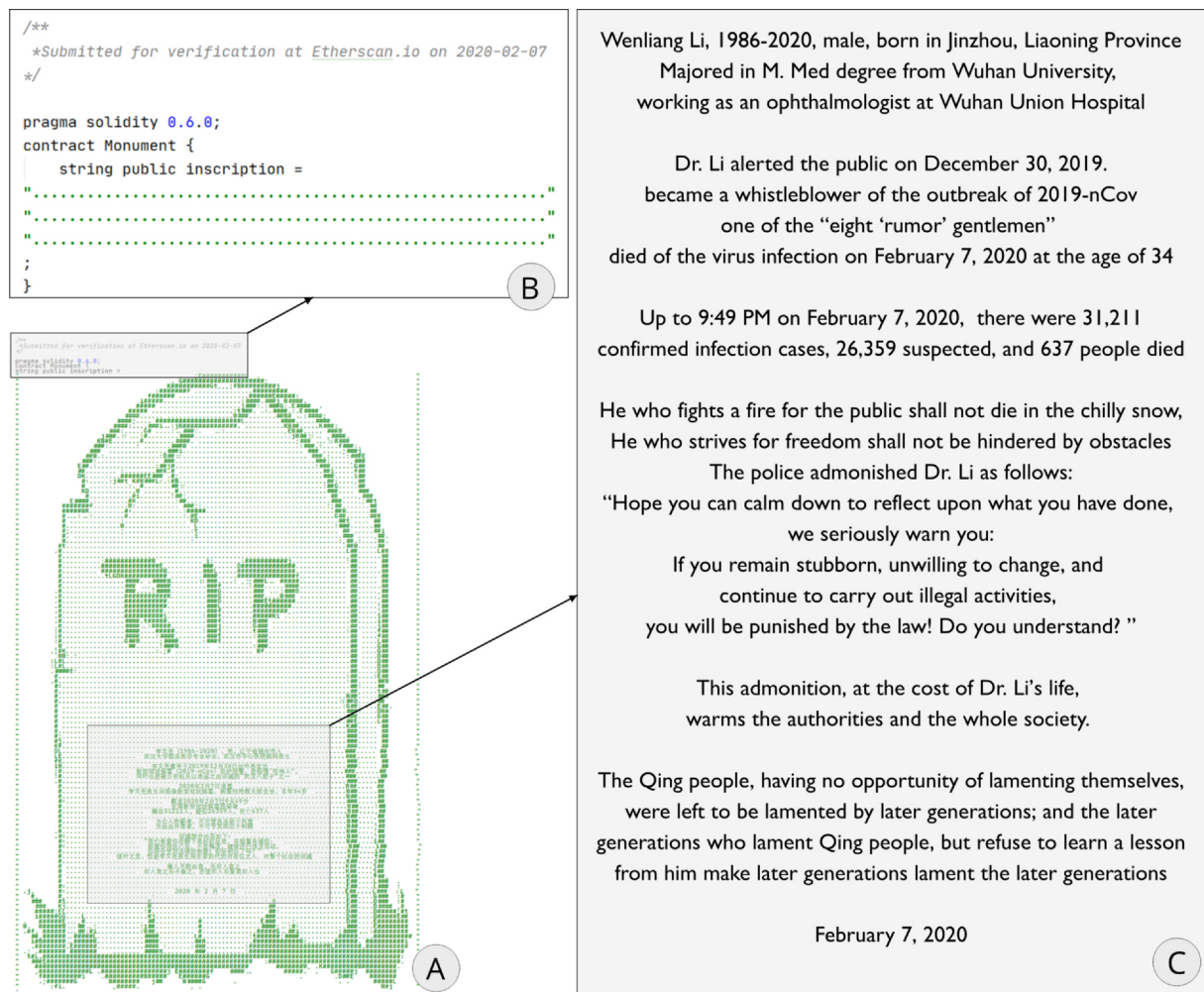


Fig. 1. The decrypted monument: (A) a photo of the monument, (B) a code snippet used to create a contract class entitled Monument, and (C) a translation of the inscription.

cyberplace, virtual place, digiPlace and remote place; and place can be made, marketed, branded, or even spoofed (Adams, 1998; Wellman, 2001; Kotler and Gertner, 2002; Kavaratzis, 2005; Zook and Graham, 2007; Pierce et al., 2011; Bocco, 2016; Zhao et al., 2019). In this light, the encrypted monument on blockchain represents a new type of place. We, therefore, coin a new term “crypto place” to signify this emerging geographical phenomenon on blockchain. To the best of our knowledge, this review represents geographers’ initial efforts on this new type of place. Through this review, we are not to make any political or moral judgment about this encrypted monument but rather to primarily focus on the legitimacy of the crypto place, its characteristics, and its potential social implications. In this way, we call on human geographers and other social science scholars to explore the opportunities and challenges brought by blockchain to contemporary geographical studies.

In the remaining sections, we review the literature on monuments and their relevance to place, and then elaborate on the concept of crypto place as evidenced by the encrypted monument for memorizing Dr. Li. We further reflect upon the unique theoretical contribution of this innovative technology to geography and suggest potential research directions.

2. Monument: A place for memories

A monument is an artificial structure to commemorate a person or event (Johnson, 1995). In addition to physical monuments, our analysis

also encompasses virtual monuments on social media or other websites, like an augmented-reality monument to the Stonewall Riots was created in New York City to celebrate the LGBTQ+ community (Fitzgerald, 2019). Another example is the Worldwide Cemetery that enables remote visitors to place virtual flowers on the “graves” of the dead.¹ Just like their physical counterparts, these virtual monuments also allow people to memorize those who passed away (Harvey, 1979); and to incorporate the past experience to collective consciousness (Boym, 2009).

Most of the physical monuments will be damaged as time goes by, although exceptions exist, like Mount Rushmore or the Great Wall in China. Even a virtual monument on Internet or social media could be censored by sovereign authorities (Zhao, 2020). The given meaning of a monument could easily decay too (Özbek, 2018). In most cases, later generations are likely to associate new connotations to a monument (Muzaini and Hamzah, 2014). The sense of place to a monument is constantly negotiated between the monument founders and the visitors, and enriched by both the present and the past (Auster, 1997). Thus, the specific meanings of a monument evolve continuously rather than being inscribed permanently.

¹ Refer to <https://cemetery.org>.

3. The birth of crypto place

As indicated by Agnew (2011), a legitimate place consists of three fundamental dimensions: the location, locales, and sense of place. In light of this idea, we argue that “crypto place” can be built on blockchain using smart contracts. A crypto place manifests itself with a decentralized location, immutable locales and transaction-based sense of place. We will further exemplify the structure of crypto place using the encrypted monument for Dr. Li.

3.1. Decentralized location

The location signifies the geographical area of place. Signifiers like toponym, address, latitude and longitude coordinates, military grid reference (MGRS), and even What3Word can refer to a unique place on the Earth's surface. Crypto place is signified by its contract address. For example, the encrypted monument for Dr. Li was constructed by a smart contract with a unique address: 0x6e46d3ab7335fffb0-d14927e0b418cc08fe60505. It was created on the block height of 9,432,824 in the Ethereum blockchain. In addition, an initial transaction was created at the following unique address: 0xb16c93d6f51ee7a68d626be22add24455db0a4644c68-da69af6705981c77820e) to permanently record the smart contract. Both the smart contract and the initial transaction can be openly accessed using any Ethereum mirror sources (e.g., Etherscan or Google BigQuery dataset of Ethereum).

Rather than a conventional one-to-one relationship between a location and its place of reference, this unique contract address can refer to multiple Ethereum nodes, which have cloned/synchronized the record of the initial transaction. This type of decentralized reference is established mainly because each transaction will be anchored to a unique block, and each block is synchronized to a few Ethereum nodes to ensure that the entire network functions properly. Ethereum users may still visit or transfer digital assets to this crypto place even if a single node fails. In this sense, a crypto place, rather than existing at a single location, is decentralized at various Ethereum nodes.

A place, no matter physical or virtual, is constantly influenced by the existing political powers. People in that place will either intentionally or unintentionally self-discipline in order not to express any extreme emotions towards that place (Pallot, 2005). The dominating power determines the relationship between people and the place where they are, and further affects how a place evolves. Although crypto place is still influenced by the existing political powers, its decentralized location makes it difficult for any single user, organization or sovereign state to control the entire ownership of the crypto place (cf., Di Masso and Dixon, 2015). Thus, a crypto place is subject to less surveillance from any central authorities or sovereign powers (cf., Curtis, 2003), with this lower risk urging us to be more vigilant about potential malicious activities. For example, if a hacker steals a user's private key to make illegal transactions, convey deceitful content or incite hatred, no immediate punishment could be carried out since no central authority or systemic mechanism is responsible for checking in and alerting users about such misuse (Wieczner, 2017).

3.2. Immutable locales

The locales of a crypto place include both material and non-material components. The material component includes the hard drive disks on which the contract transaction records are stored, as every bit of the record will trigger re-orientation of its magnetic fields of the hard drive disk. The non-material locales primarily consist of a few parameters of the initial transaction, such as its address, transaction status, the locating block, timestamp, addresses of the sender (from) and recipient (to), the transfer value, gas fee, and input data, as shown by the transaction at the encrypted monument in Fig. 2. The input parameter empowers the crypto place's creator to leave contextual information

and encrypt various types of digital files, such as text, images, audio, or video (Wang et al., 2018). For example, the encrypted monument was programmed using ASCII art (Xu et al., 2010). ASCII art utilizes less data to provide the same amount of information as displayed by images or video. Although the crypto place's creator did not assign any Ether fee (transfer value), but the creation of it cost 8,459,394 gas, which equals to 0.067675152 Ether (\$17.05 based on the Ether to U.S. dollar exchange rate on the day it was created).

Unlike conventional monuments that can be damaged or destroyed, the locales of a crypto place are almost immutable (cf., Auster, 1997; Özbek, 2018). If one attempts the extremely difficult task of changing an existing transaction, he or she must also rebuild all the involved blocks and the subsequent transactions. Such a modification is almost impossible since it needs to be executed in every clone of the ledger of the blockchain. The immutable locale is a definitive feature that will prevent the stored information regarding the locale from being corrupted.

Considering this immutability feature, an Ethereum user must be very careful before initiating a smart contract because the locale exists perpetually and cannot be deleted. For example, if any sensitive private information is disclosed at the locale, it may have a disastrous effect on the people involved due to the possibility of long-term misuse. It is essential to consider the potential consequences before initiating a smart contract.

3.3. Transaction-based sense of place

Ethereum users can share their impressions and perceptions of a crypto place by initiating new transactions on its smart contract address. To initiate a transaction, the sender needs to transfer in any amount of Ether, and the execution of the transaction also costs some gas fee. Considering the cost, the value-laden nature of these transactions reflects the initiator's concern about a crypto place. Moreover, it is possible to express one's support for a crypto place by adding additional information to this input parameter. One piece of eulogy to Dr. Li was encrypted in the input parameter as below.

I born and live in Hubei, China. I suffered great pain this spring, I lost a relative that I loved very much. And I witnessed many other painful people like me.

Please give me some eths, I want to feel be loved and blessed, and I want to help people. I will use all the eths to help painful people here I see and know for real.

I have been a good people all my life till now, but now I'm feeling that I'm turning into a bad person inside out, I am longing for love. I have some talents and have worked hard, but I am nothing but mere mortal. I am so incompetent.

This transaction initiator, who lives in Hubei Province - the center of this epidemic in China, describes his or her suffering, pain, and struggle. This transaction initiator's approach of fund raising is not justified; however, we did not plan to criticize this approach. Instead, the existence of the input parameter empowers common Ethereum users to express their sense of place. Such sense of place that is expressed on the blockchain is transaction-based and is thereby value-laden. The transference of digital assets and the payment of the gas fee implicitly shows a sender's respect for the crypto place, and the inherent input parameter can record the content of one's sense of place. Practically speaking, since the size of the input parameter is positively related to the cost, each user needs to seriously weigh the benefit of initiating a transaction by asking if it is worthwhile to express one's feelings about a crypto place through a transaction. The cost would be expensive if a large amount of transaction fee is required.

4. Discussions and concluding remarks

In this review, we introduce the emerging phenomenon of crypto


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{
  'hash': 0xb16c93d6f51ee7a68d626be22add24455db0a4644c68da69af6705981c77820e,
  'transactionIndex': 22,
  'blockHash': 0x7704b4e8188249acc6f41469040332468830debacd5895949d5498819683f5bf,
  'blockNumber': 9432824,
  'from': 0x16A51077E0548Cb265b223D180844BeAfb76E03b,
  'to': None,
  'nonce': 303,
  'r': 0x5a25e1f33829f6f7cc8b1115ad3e7094aa0243be762f5fb51feb026bb5786545,
  's': 0x28b70c72428881e80740e82cbd00d78270f2bcd36e967ded85d0288bf61b96a5,
  'v': 38,
  'input': 0x60806040526040518061328001604052 ... // Length: 27,824 digits
  'value': 0,
  'gas': 8459394,
  'gasPrice': 8000000000,
}

```

Fig. 2. The record of the initial transaction.

place on blockchain – a newly charted territory that is comprised of three dimensions: a decentralized location, immutable locales and transaction-based sense of place. The creation and use of a crypto place are meant to escape the suspected/perceived threat of the sovereign power by using the Ethereum blockchain that is a socio-politically decentralized and geospatially distributed at global scale. Moreover, the experience of interacting with a crypto place can be eloquently described by Ludwig Binswanger's idea of “being-beyond-the-world”, which highlights the potential of human beings to transcend the limitations of everyday life in the secular world (Binswanger, 1941). Indeed, as blockchain enables us to chart new encrypted territory, people become capable of assigning encrypted meanings to these new spaces. Such an encryptable place does not just exist in a virtual form or at a remote location, it is beyond the constraints of our secular world, and secured by the crypto algorithms. This process suggests that people, although confined to the secular world, can still break the space-time constraints and experience “being-beyond-the-world” through the crypto place. Overall, we realize that this emerging crypto place make our long-accepted geographical notion of place to further evolve.

The opportunities the crypto place offers are tempting; however, we should not neglect some negative impacts. On one hand, the blockchain technology empowers us to create a permanent place in an encrypted form, which securely maintain our sense of place, especially when facing either threat from the sovereign powers on the ground or censorship online. On the other hand, the lack of surveillance would lead to the dissemination of false information, provocation, and confusion. For future research, we would like to raise a more holistic understanding towards the crypto places on blockchain, and catalyze the use of crypto places for the purpose of preserving humankind's collective memories recording the fading sense of place from marginalized groups and saving disappearing cultural heritage and landscapes. We would like to invite more geographers to further enrich the concept of place in today's data-intensive and decentralized world.

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